Supplemental Sampling Analysis Plan (SAP) for River and Stream Water Quality Monitoring – FY 2016

Gold King Mine Spill Response

Colorado Department of Public Health and Environment
Water Quality Control Division
4300 Cherry Creek Drive South
Denver, CO 80246

1.0 INTRODUCTION

This Sampling and Analysis Plan (SAP) describes the sampling and analysis methods that will be affiliated with the collection of water quality samples on Cement Creek and Animas River, including tributaries, if necessary, following the mine spill at Gold King Mine on August 6, 2015.

The Water Quality Control Division's (Division) Quality Management Plan (QMP) states that a quality assurance and quality control program will be implemented through the mandatory use of smaller sampling and analysis plans. In accordance with this directive, this SAP will be considered supplemental to the Division's SAP for routine River and Stream Water Quality Monitoring prepared for State fiscal year 2016.

2.0 BACKGROUND

On August 6, 2015 approximately 3 million gallons of accumulated mine drainage was accidently released into Cement Creek in the Upper Animas River basin. The slug of fluids consisted of elevated concentrations of heavy metals, including but not limited to arsenic, zinc, cadmium and copper.

The spill initially began in Cement Creek and then flowed south towards the Town of Silverton where it merged with the confluence of the Animas River. The spill slug then continued southward along the Animas River towards the State line with New Mexico. According to information gathered from on-site personnel the spill continues to enter Cement Creek at a steady rate of 400+ gallons per minute.

The Environmental Data Unit's overarching objectives are to collect, assess, and report data regarding the chemical, physical and biological integrity of the State's surface waters. In support of these objectives, the Environmental Data Unit maintains a network of statewide monitoring sites, including trend and synoptic study sites, for collecting chemical, physical, and biological data. It is the Division's intention to sample monitoring stations already in its network of sites as well as points of entry at public water systems along both Cement Creek and the Animas River beginning August 6, 2015 and continuing into the near future.

3.0 TECHNICAL APPROACH

Under this supplemental SAP, water quality monitoring activities will be primarily focused on Cement Creek and the Animas River and points of entry at public water systems in order to support decision-making related to the current status of water quality on those two waterbodies. Other tributaries will be sampled on an "as needed" basis, if deemed necessary.

Post-spill water quality data will be compared to historical baseline data at pre-existing routine and trend sites to determine current status and rates of recovery in water quality.

3.1 SAMPLING GOALS AND OBJECTIVES

The goals and objectives specific to this supplemental SAP are as follows:

- Collect water quality data at several sites on Cement Creek and the Animas River. These sites will be routine or trend sites previously visited by the Division. Appropriate personal protection equipment will be used at each site and includes, but is not limited to: hip waders, nitrile gloves, hard hat, reflective safety clothing, eye protection, personal floatation device, steel toed boots.

- Collect water quality data at several points of entry to public water systems in the Upper and Middle Animas River basin. Sites identified may be modified but include at a minimum: CO0134840 Glacier Club, CO0134020 Animas WC, CO0134065 Blue Sky Ranch, CO0134480 Goodman POA, CO0234040 Bar D Chuckwagon, CO0134635 Lilly Belle, CO0134150 City of Durango, CO0134660 Old Homestead MHP, CO0134758 Scenic Square Subdivision, CO0234800 Sundown Acres RV Park. Appropriate personal protection equipment will be used at each site and includes, but is not limited to: nitrile gloves, hard hat, reflective safety clothing, eye protection, steel toed boots.

- Collect sediment quality data at several sites on the Animas River. These sites will be responsive in nature and not intended to be long term monitoring. Appropriate personal protection equipment will be used at each site and includes, but is not limited to: hip waders, nitrile gloves, hard hat, reflective safety clothing, eye protection, personal floatation device, steel toed boots.

4.0 RESPONSIBLE AGENCY AND CONTACTS

The Field Services Section will be primarily responsible for the limited coordination and implementation of targeted, site-specific monitoring. The Environmental Data Unit will provide field support by collecting water quality samples and will provide inclusive oversight of the Quality Assurance/Quality Control (QA/QC) affiliated with this SAP. The Hazardous Waste Division will provide field support by collecting sediment samples. These samples will be collected per the Colorado Department of Public Health and Environment's Standard Operating Procedure No. 17, Sediment Sampling.

It is anticipated that other Division units will assist with planning, coordination and

implementation, as needed throughout the execution of this SAP.

4.1 PROJECT COORDINATOR AND CONTACTS

Greg Naugle
Colorado Department of Public Health and Environment
Water Quality Control Division
Field Services Section – Section Manager
303-692-3582; greg.naugle@state.co.us

CDPHE Water Quality Control Division

Heather Drissel – 719-295-5070, heather.drissel@state.co.us
Casey Kay – 970-248-7154, casey.kay@state.co.us
Jean Aldrich – 303-692-3396, jean.aldrich@state.co.us
Jorge Delgado – 970-231-8182, jorge.delgado@state.co.us
Kelly Jacques – 303-808-0436, kelly.jacques@state.co.us

CDPHE Hazardous Waste and Materials Divisions

Mike Cosby – 970-589-0687, michael.cosby@state.co.us
Miquette Gerber – 703-244-1613, miquette.gerber@state.co.us

4.1 EMERGENCY ACTION PLAN

Check in points will be at the incident command center which is located at the La Plata Fairgrounds. Operational Area: Areas include all sampling locations for surface water samples, sediment samples, and public water system. If emergencies arise please call the following numbers, as appropriate:

- Heather Drissel, CDPHE WQCD Safety Coordinator 719-295-5070
- San Juan County Fire Department 970-387-5023 or 911
- San Juan Sheriff 970-387-5531 or 911
- Flight for Life 800-332-3123
- Mercy Regional Medical Center 970-247-4311

5.0 DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is used to establish performance or acceptance criteria for data collection activities. These criteria in turn serve as the basis for designing a plan for collecting data of sufficient quality and quantity to support goals of the Division's monitoring plan. The DQO process is systematic and begins by defining the problem and identifying the goals and objectives of the SAP. Subsequent steps identify feedback participation and measurement performance criteria. Data collection methods and the analytical approach are designed to satisfy plan goals and objectives of the SAP.

5.1 MEASUREMENT PERFORMANCE CRITERIA

A central aspect of DQO process is the documentation of the data quality indicators which specify the performance criteria and acceptance criteria for the quality of the data collected for the plan and for existing data to be included in a project.

5.1.1 PRECISION

Precision is a measure of reproducibility of test results. A series of measurements on the same sample for the same parameter is compared to the average value. Precision is estimated by means of duplicate/replicate analyses. Precision is best expressed in terms of the standard deviation or the relative percent difference (RPD) between field duplicate measurements as show below.

$$RPD = [(x_1 - x_2) / \{(x_1 + x_2)/2\}] \times 100$$

RPD = relative percent difference (%)

x_1 and x_2 = duplicate measurements of the same parameter

The smaller the RPD, the more precise are the measurements. The usability of duplicate measurements is assessed during data validation.

The Colorado Department of Public Health and Environment's Laboratory Service Division (LSD) is responsible for establishing measurement criteria for precision of the analytical procedures used in projects where water quality data are collected. Data for these Quality Control procedures are obtained by analyses of replicate, split and spiked samples, and blanks.

5.1.2 ACCURACY

Accuracy is the degree of agreement of a measurement with an acceptable reference or true value. This is accomplished by comparing a measured value to an accepted reference value in a sample of known concentration or by determining the recovery of a known concentration spiked into a sample.

$$\%R = \{100 (x_s - x_u) / K$$

%R = percent recovery

x_s = measured value for spiked sample

x_u = measured value for unspiked sample

K = known value of the spike in the sample

LSD is responsible for establishing measurement criteria for accuracy of the analytical procedures used in projects where water quality data are collected. Data for these Quality Control procedures are obtained by analyses of replicate, split and spiked samples, and blanks.

5.1.3 COMPLETENESS

Completeness is the percentage of valid measurements or data points obtained, as a proportion of the number of measurements or data points planned for the project. Completeness is affected by such factors as sample bottle breakage and acceptance/non-acceptance of analytical results. A target of 90% completeness will be considered acceptable. To be considered complete, the data set must contain all Quality Control check analyses verifying precision and accuracy for the analytical protocol. Completeness is then determined by the following:

> % Completeness = (Number of Valid Measurements / Total Number of Measurements Planned) x 100

6.0 FIELD EQUIPMENT

The following sections detail the field equipment that will be necessary to execute this SAP and calibration of equipment, as applicable, to ensure collection of defensible data.

6.1 EQUIPMENT LIST

The following field equipment is needed to complete the sampling and analysis program:

- Multi-sensor sonde and handheld device with GPS receiver
- 47 mm filter holder
- 47 mm and 0.45 µM pore size cellulose acetate membrane filters
- 47 mm and #28 pore size glass fiber "roughing" pre-filters
- Sterile plastic syringe
- Disposable forceps
- Air pump with diffuser stone
- Calibration cups ("cal cups")
- Latex or nitrile gloves
- Indelible markers or pencils
- De-ionized water (DI)
- Field notebooks or electronic forms stored on handhelds
- Chain-of-custody forms
- Coolers and ice preservative
- Bucket/rope

6.2 FIELD INSTRUMENT CALIBRATION

All monitoring equipment used in the field will be maintained according to the manufacturer's recommendations. The calibration frequency, procedures, and scheduled maintenance for field instruments are found in the Division's Standard Operating Procedures (SOP), and equipment instruction manuals. Meters should be calibrated before use each day, and per instructions in the operations manual. Division

personnel using field instruments are expected to read and be thoroughly familiar with all procedures detailed in SOPs and instruction manuals for all field instruments.

These methods are aligned with the protocols detailed in the Division's *Standard Operating Procedures for Water Quality Monitoring Activities* (March 2010).

7.0 SURFACE WATER SAMPLE COLLECTION

Stream samples are collected as "grab" samples. The grab sample is collected by filling each sample bottle directly from the stream. Alternatively, a sampling container may be used to collect a large enough volume of the water to fill all sample bottles. The grab sample should be collected from the main channel thalweg (the line of fastest flow in the stream channel and often the deepest), just below the water surface. If stream conditions are unsafe for the sampler to wade into the thalweg, the grab sample may be made from the stream bank where active flow occurs or where stream flow is directed along the bank, or from a bridge using a rinsed bucket.

These methods are aligned with the protocols detailed in the Division's *Standard Operating Procedures for the Collection of Water Samples* (March 2010).

7.1 SURFACE WATER FIELD MEASUREMENTS

Field measurements for pH, temperature, dissolved oxygen, and specific conductance will be made at the same time when water chemistry samples are collected. These measurements can be made *in situ* (directly from the stream), or from a discrete sample collected in a container (bucket). These measurements shall be recorded using the field equipment identified in Section 6.1 of this SAP. The field measurements should follow the Division's *Standard Operating Procedures for the Collection of Water Samples* (March 2010).

8.0 SAMPLE CONTAINERS AND PRESERVATION

The Division's Environmental Data Unit collects routine stream water samples to be analyzed for nutrients, total recoverable and dissolved metals, neutrals (for parameters needing no preservative, or other special bottle prep) , and microbiological. A sample set will include at least five sample bottles to be filled at each stream site, but may be as high as 6 bottles depending on the specific sampling location.

Samples collected shall include at a minimum, a nutrient (acid preserved), a neutral (unpreserved, non-metal), dissolved metals (filtered), total recoverable metals, and a 50 ml centrifuge BD bottle. Additionally, as needed, samples collected shall also include an *E.coli* microbiological.

1. Nutrient – 250 ml. Container identified as "Nutrient".

   Fill with grab sample. This bottle contains acid for preserving the sample

and should be handled with care. Do not rinse, and do not over-fill. Leave approximately ½ inch headspace to allow for mixing and expansion.

2. Neutral – 250 ml. Container identified as "Neutral".

   Fill with grab sample. Rinse with sample source water three times before collecting sample.

3. Dissolved metals (filtered) - 250 ml. Container identified as "Filtered Metals".

   Metals bottles have been acid washed, and do not need to be rinsed with sample before filling. Samples are to be filtered through a 0.45 µM cellulose acetate filter. Pre-filters can be used. Filters and pre-filters will be wetted with D.I. water and the first 30-50 ml of sample filtered to waste before final sample is collected. Leave ½ inch headspace to allow for mixing and expansion.

4. Total Recoverable Metals (unfiltered) – 250 ml. Container identified as "Metals"

   This sample is a grab sample. Metals bottles have been acid washed, and do not need to be rinsed with sample before filling.

5. BD Centrifuge tube – 50 ml. Container identified as "BD Falcon".

   Fill with grab sample to ¾ mark. Rinse with sample source water three times before collecting sample. Sample is frozen upon receipt by LSD. This sample serves as a backup.

6. *E. coli* – 100 ml. Container identified as "Microbiological".

   These samples are grab samples. The microbiological sample bottles have been washed and sterilized, so no rinsing with sample is necessary. Fill the bottle to just below the shoulder to the "fill line".

Samples should be placed in a cooler and stored on ice immediately after collection for transport to LSD or other sub-contracted laboratories.

9.0 SAMPLE DOCUMENTATION AND HANDLING

The following sections describe the documentation of field activities and documentation and handling of samples detailed in the Division's *Standard Operating Procedures for Water Quality Monitoring Activities* (March 2010).

9.1 FIELD DOCUMENTATION

Field notebooks, including daily field forms and photographs will be used to document field activities.

9.1.1 FIELD LOG NOTEBOOKS AND FIELD FORMS

All staff shall document all monitoring activities using standard field log notebooks, which contain pre-printed field log forms on Rite-in-the-Rain waterproof paper. Each sampling event will have its own log entry, with all pertinent data requested on the field log form provided. Each log entry will include at least the following; sample date and sample customer ID number, site number and description, sample collector's name, site latitude and longitude and associated GPS documenting data, start/sample/end times, how and where the sample was collected, whether samples were collected directly into the sample container or poured out of a bucket, all field measurements and how the measurements were taken (e.g. directly out of the stream, out of a bucket), sample filtering information, observations and comments, and summary of QA activity, if any.

All documentation will be done at the time of sampling using the Division's preprinted and formatted "Monitoring Field Log" notebooks (see Appendix A). Only field team members may be in custody of the notebooks during field activities. Field log entries must be dated, legible, preferably made in black indelible ink, and contain accurate documentation. Corrections to erroneous data will be made by crossing through the entry and entering the correct information. The person making the correction must initial and date where the error occurred.

Optionally, staff may record all the same important "sampling metadata" on Microsoft Excel field log forms that are only presently installed on Trimble Yuma 2 handhelds and will be available beginning July 1, 2015. The data will be downloaded upon completion of each field week. Corrections may be made to the downloaded files and will follow the same protocol as discussed above.

9.1.2 PHOTOGRAPHS

Photographs shall be taken at each new site and include an upstream, downstream and benchmark snapshot. Photographs shall be downloaded, re-titled to identify the station identification, waterbody and snapshot location (e.g. upstream); and stored in the Photos folder on the Division's common "Assessment" drive.

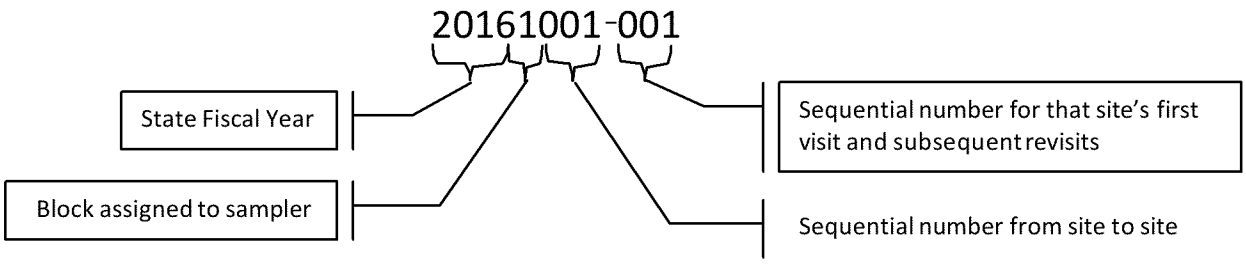
9.2 SAMPLE LABELING

Every sample will have a unique barcode identification number. Each sample shall have a barcode generated, printed on weatherproof address labels, and affixed to the exterior of each bottle set prior to a given sample trip. Each "set" shares the same barcode.

This unique barcode identification number is an eleven digit number that is bracketed by (*) asterisks. The * character is the start and stop reading character for the barcode reader. The first four numbers of the barcode are the four digit fiscal year. The fifth

number denotes the block assigned to the sampler or specific program. The remaining six numbers in the bar code are sequential numbers based on sites and site revisits within the State fiscal year. Each sampler shall be responsible for making sure that each number used in their block is unique. See example below for further details.

Example:



9.3 CHAIN OF CUSTODY

All samples will be submitted with a completed LSD "Request for Analytical Services" form for each sample set (see Appendix B). This form shall be considered the Division's official Chain-of-Custody. The form shall be completed per instructions for completing the form. All requested information shall be provided. Samples are to be immediately placed in a cooler, preserved with wet ice, and delivered to LSD or other sub-contracted laboratories. Sample holding times shall be accounted for when a schedule is projected, and samples delivered to meet all holding times. If samples will be delivered on a Friday, samples should be to the lab no later than 2 p.m. to ensure proper relinquishing of samples to laboratory staff.

The "Request for Analytical Services" form shall include an affixed unique barcode identification number, station identification, waterbody and description, date and time of sample collection, number and type of sample containers, sample media, analyses requested, sampler(s) name and affiliation, name and signature of relinquishing and receiving personnel, as well as the date and time of each custody transfer. The temperature shall be taken from a "temperature blank" within the cooler, or some other comparable means, and may be recorded on the form by Accessioning staff at LSD.

10.0 ANALYTICAL METHODS

Samples will be analyzed for the parameters and by the methods specified in Appendix C.

All methods of sample collection, preservation and analysis used in determining water quality will be in accordance with the test procedures identified in Section 31.16(2) of WQCC Regulation No. 31 *The Basic Standards and Methodologies for Surface Waters*.

11.1 QUALITY ASSURANCE AND QUALITY CONTROL

Quality assurance is a set of operating principles that, if strictly followed during sample collection and analysis, will produce data of known and defensible quality. This will ensure that the accuracy of the data can be stated with a high level of confidence. Assuring the quality of surface water data is accomplished by following standard operating procedures (e.g. observing proper sample collection techniques, proper maintenance and calibration of field meters), collecting QC samples, reviewing and analyzing QA/QC data, and making appropriate adjustments to surface water quality data collection procedures on the basis of the results of QA/QC procedures.

QA/QC procedures for the Division may be divided into three categories:

- Field procedures quality control
- Data quality control

- Laboratory quality control

11.1 FIELD QUALITY CONTROL

Standard operating procedures will be utilized as a primary tool to ensure field procedure quality control (See Appendix D for a list of SOPs). Staff performing field activities for the Program will receive the training necessary to ensure that all SOPs are fully and properly used when completing field-monitoring activity. Each project-specific SAP will describe and or reference all specific quality assurance/quality control methods to be followed. At a minimum, the following water chemistry quality control samples will be taken:

- Field duplicates
- Field blanks (also referred to as "Trip blanks")

11.1.1 FIELD DUPLICATES

Field duplicates will be field sample replicates and will be used to determine field precision. Duplicate samples, including duplicate field measurements, are a set of similar samples collected from the same site, at about the same time, and analyzed in the same manner. Duplicate samples may be equated to "fraternal twins" in that they originate from one source but each sample may contain a slightly different chemical composition. Duplicate sample results must be compared to assure reasonable agreement. In general, the acceptable results from duplicates are a 10% difference for cations, anions, and nutrients. For total and dissolved metals, particularly when concentrations are near detection levels, a difference of 10% to 50% may be allowed, based on best professional judgment by the Division's QA/QC Officer identified in Section 13.0 of this SAP.

Duplicate samples shall be taken and analyzed from a minimum of 10% of the total number of samples collected during the implementation of this SAP.

11.1.2 FIELD BLANKS

Field blanks help to ensure that sampling equipment, sampling containers, and de-ionized rinse water is effectively cleaned and/or free from contaminants that may be introduced into a sample via the equipment or rinse water. Field or Trip blanks, also referred to as equipment blanks, are blank solutions (solutions of DI water) that are processed through the equipment used for collecting and processing an environmental sample. Four types of surface water quality sampling equipment have blank samples taken from them:

- DI water container
- Sample container
- Filter apparatus
- Sample collection device (bucket)

All results from equipment blank samples shall be at or near the minimum reporting level (or non-detect level). Any detection of contaminants in equipment blanks shall be addressed by the Division's QA/QC Officer and may entail modified cleaning or decontamination procedures.

Field blanks shall be collected one per "sample trip" or one per week if you are out for entire week or several days at a time.

11.2 DATA QUALITY CONTROL

Data quality control procedures and measures are grouped into four categories to be reviewed:

- Steps for measuring compliance with WQCD procedures
- LSD issues
- Bias and errors
- Additional considerations

Due to the length and complexity of this section, reference may be made to the Division's *Quality Assurance Project Plan for Surface Water Monitoring and Assessment* (draft Dec 2014), which is on file with the Project Coordinator listed in Section 4.1 of this SAP. All QC data will be reviewed following completion of this SAP. If all data-acceptance criteria in the SAP are met, then the analytical data are acceptable.

11.3 LABORATORY QUALITY CONTROL

The Division will utilize LSD as the primary source of analytical services for water samples during the implementation of this SAP. The following items will be reviewed, at a minimum, to verify laboratory QA/QC:

- Verifying QA/QC with LSD personnel
- Method Detection Limits and Reporting Limits
- PQL issues
- Duplicates and blanks
- Contamination issues
- Post-sample submittal preservation

If analytical services are provided by a laboratory other than LSD, the same steps will be taken, as outlined above, to verify acceptable laboratory quality control.

12.0 DATABASE MANAGEMENT

The Division uses EQuIS[1] ("Environmental Quality Information System") as the primary database for water quality data. Data management objectives and data quality objectives are discussed in the Division's QMP and program or project specific QAPPs and other SAPs.

Water chemistry samples are collected along with field data and visual observations per instructions in Sections 7.1 and 9.1, respectively. Field measurements are recorded by either an In-Situ Rugged Reader or Trimble Yuma 2 handheld and downloaded to a desktop PC upon completion of the sample trip.

[1] Developed by Earthsoft

Sample sets are delivered to LSD for laboratory analysis. When samples are collected in remote locations, occasionally microbiological samples are delivered to sub-contracted laboratories to facilitate quicker analysis. Field data and observations are downloaded into an Excel® spreadsheet by the individual field technicians. The LSD returns chemical data via monthly Excel® spreadsheets known collectively as "laboratory extracts" or may be obtained later through a CDPHE SQL[2] based server known as the Integrated Data Report (IDR). These data as well as off-site microbiological data are returned in an electronic format to the Division's Environmental Data Unit.

Field data and observations along with microbiological data received from off-site laboratories are transferred into a format to be joined with the water chemistry data by the EQUIS database manager and support staff. Field, chemistry, and microbiological data coalesce and are analyzed for quality control before data is uploaded to EPA's WQX. Once in the WQX, the data will be available to all interested parties through the EPA's Water Quality Warehouse STORET.

13.0 PERSONNEL

The following key personnel from the Field Services Section and Environmental Data Unit and other Clean Water Program units will complete the tasks described in this SAP:

Heather Drissel (WQCD Grand Junction office)
Casey Kay (WQCD Grand Junction office)
Jean Aldrich (WQCD Denver office)

Other Division staff not listed above may occasionally participate in field activities or database management on an as-needed basis.

14.0 SCHEDULE

The tentative schedule listed in Appendix D is developed for this SAP and shall be implemented between July 1, 2015 and June 30, 2016. A map illustrating the statewide distribution of these scheduled sites may be found in Appendix E.

15.0 REFERENCES

Quality Assurance Project Plan for Surface Water Monitoring and Assessment. Colorado Department of Public Health and Environment, Water Quality Control Division. May 2015.

[2] A special-purpose programming language designed for managing data held in a relational database management system

Quality Management Plan for the Collection and Utilization of Environmental Data. Colorado Department of Public Health and Environment, Water Quality Control Division. March 2011.

Standard Operating Procedures for the Collection of Water Samples Colorado Department of Public Health and Environment, Water Quality Control Division. March 2010.

Standard Operating Procedures for Water Quality Monitoring Activities . Colorado Department of Public Health and Environment, Water Quality Control Division. March 2010.

The Basic Standards and Methodologies for Surface Waters, Regulation No. 31 (SCCR1002-31). Colorado Department of Public Health and Environment, Water Quality Control Commission. December 2010.

16.0 APPROVAL

Greg Naugle
Field Services Section Manager

f]-11-/s-
Date

Date

Chris Theel
Monitoring and Data Work Group Lead and
QA/QC Officer

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Date

APPENDIX A – FIELD LOG FORM

Sample Bar Code Label

Start Time:_____hrs Sample Time:_____hrs End Time:_____hrs

Site No. _____ Sample Collection Date:_____
Stream / Site Name _____
Location Description _____
_____
GPS: Type_____ No._____
Latitude _____N Longitude _____W Elevation _____
Map Datum _____ Sat Status _____

SAMFLE COLLECTION INFORMATION : SAMPLER: _____
Sampling Location: ☐ Bridge ☐ Instream ☐ Other ☐ Left Bank ☐ Thalweg ☐ Right Bank
_____
_____
Collection Method: ☐ From bridge w/bucket ☐ Instream w/bucket ☐ Instream direct
_____

Filtering Equipment:	☐ Geo Tech Pump	☐ Syringe	☐ Other _____
Filter Holder:	☐ 142 mm Geo Tech	☐ 47mm Swinnex	☐ Other _____
Filter Paper Type:	☐ 142 mm Geo Tech	☐ 47mm Geo Tech	☐ Other _____
Filtering Method:	☐ Instream direct	☐ From bucket	☐ From sample container

Filters Used – Total Count: Roughing _____ Final _____

De-Ionized Water: Source _____ Date _____/_____/_____
Sample Bottles: Source _____ Date_____/_____/_____

QA / QC Samples: Yes ☐ / No ☐ Type: ☐ Duplicate ☐ Blank ☐ Spike
QA / QC Sample Bar Code No: _____ _____ _____

FIELD MEASUREMENTS:
Instruments Used: ☐ In-situ ☐ Quanta ☐ YSI Other _____ Other_____
Instruments Calibrated at this site? Yes ☐ / No ☐ Meter Index No. _____
Measurement Method: ☐ From bridge w/bucket ☐ Instream w/bucket ☐ Instream direct
Measurements:
Stream Temp _____° C Spc _____ uS/cm DO _____ mg/L
pH _____su @ _____° C T. Alk _____ mg/L Air Temp _____° C
Winkler DO _____ mg/L Other _____ Other _____
Total Alkalinity calculation: _____

Other Field Activity (Check all that apply):
☐ Habitat ☐ RBP ☐ Macroinvertebrate ☐ Flow ☐ Other _____

Field/Weather Observations and Comments: _____
_____
_____
Samples Collected (Check all bottles that apply):
Metals (250 ml) ____ Metals, Filtered (250 ml) ____ Metals (1 L)____ Metals, Filtered (1 L)____
Nutrient (250 ml) ____ Nutrient (1 L) ____ Neutral (1 L) ____ Neutral (250 ml) ____ Micro ____
Other _____
Samples on Ice: Yes ☐ / No ☐ Receiving Lab: Chemical _____ Micro _____
Maps, Drawings, or Additional Comments on BACK

BAR CODE LABEL

BLANK

BAR CODE LABEL

DUPE

BAR CODE LABEL

SPIKE

APPENDIX B – REQUEST FOR ANALYTICAL SERVICES FORM

Colorado Department of Public Health and Environment

Laboratory Services Division
8100 Lowry Boulevard, Denver, CO 80230-6928
US Mail: PO Box 17123, Denver, CO 80217
(303) 692-3090 fax (303) 344-9989

Sample barcode here

REQUEST FOR ANALYTICAL SERVICES

Note: This form to be used from 7/1/14-6/30/15

CUSTOMER

Customer ID: 00000372
Name: CDPHE – WQCD – [Unit name here]
Address: 4300 Cherry Creek Drive South
City/State/Zip: Denver, CO 80246
Contact Name: [your name here]
Contact Phone: [your phone # here]
Contact Email: [your email address here]

SPECIMEN INFORMATION

Collected: M-D-Y
Military Time: : ☐ a.m. ☐ p.m.
Collected by:
Matrix: Surface Water

SAMPLE SITE

Station ID:
Stream Name:
Description:
☐ Check if new station

BOTTLE INFORMATION

Check each box that applies

BOTTLE	M	FM	Nut	Nut	TN*	PHOS	SVOC	EC	BIO	HG	Number
250 ml	1	1	1	1							4
500 ml											1
125 ml					1						1
50 ml BD						1					
1 Liter Amber											
Micro											
Other											

TEST ORDER (Check appropriate box) * Requires off-site analysis per FY15 WQCD-LSD MOU

METALS

TREC	DISS	TOTAL	
☐	☐	☐	Aluminum
☐	☐	☐	Antimony
☐	☐	☐	Arsenic
☐	☐	☐	Cadmium
☐	☐	☐	Chromium
☐	☐	☐	Copper
	☐		Hardness, Total
☐	☐	☐	Iron
☐	☐	☐	Lead
☐	☐	☐	Magnesium
☐	☐	☐	Manganese
	☐	☐	Mercury
☐	☐	☐	Nickel
☐	☐	☐	Potassium
☐	☐	☐	Selenium
☐	☐	☐	Silver
☐	☐	☐	Zinc
☐			_____

NUTRIENTS

- ☐ Nitrate/Nitrite
- ☐ Nitrogen, Ammonia
- ☐ Nitrogen, Kjeldahl
- ☐ Nitrogen, Total
- ☐ Phosphorus, Total

NEUTRALS

- ☐ Alkalinity, Total
- ☐ BOD/COD (circle)
- ☒ Chloride
- ☐ Conductivity
- ☐ Fluoride
- ☐ Nitriteor Nitrate (circle)
- ☐ Phosphate, Ortho
- ☐ Solids, Dissolved
- ☐ Solids, Total Suspended
- ☐ Solids, Total
- ☐ Sulfate
- ☐ _____

OTHER

- ☐ DOC
- ☐ TOC
- ☐ Cyanide, Direct
- ☐ Sulfide
- ☐ UV @ 254
- ☐ Nonylphenol
- ☐ _____

RADIOCHEMISTRY

- ☐ Radium 226
- ☐ Radium 228
- ☐ _____

MICROBIOLOGY

- ☐ Total Coliform, PA
- ☐ Fecal Coliform, MT
- ☐ E. coli, MPN
- ☐ _____

PHYTOPLANKTON (LAKES)*

- ☐ Chlorophyll a
- ☐ Species composition & counts

PERIPHYTON (STREAMS)*

- ☐ Chlorophyll a
- ☐ Ash free dry mass
- ☐ Species composition & counts

TEST PANELS

- ☒ WQCD Routine Panel
- ☐ WQCD Trend Panel
- ☐ CPW Panel
- ☐ Mining - Metals & Minerals
- ☐ Mining - Nutrients
- ☐ Waste Water Project
- ☐ Other _____
- ☐ Additional Parameters

DEPOSITION	CHAIN OF CUSTODY		
RELINQUISHED BY:	DATE/TIME:	RECV BY:	DATE/TIME:
RELINQUISHED BY:	DATE/TIME:	RECV BY:	DATE/TIME:
RELINQUISHED BY:	DATE/TIME:	RECV BY:	DATE/TIME:
TEMPERATURE AT RECEIPT: °C	LSD Internet Address: http://www.cdphe.state.co.us/lr/		Form #251 - Revised: 06/19/2014

APPENDIX C – PARAMETERS, METHODS, HOLDING TIMES AND UNITS

Analysis	Methodology	Holding Time	Turn-Around Time	Units
METALS PANEL:				
ALUMINUM	EPA 200.7	6 MONTHS	30 DAY	ug/L
ARSENIC, DIS	EPA 200.8	6 MONTHS	30 DAY	ug/L
CADMIUM	EPA 200.8	6 MONTHS	30 DAY	ug/L
CALCIUM	EPA 200.7	6 MONTHS	30 DAY	mg/L
CHROMIUM	EPA 200.7	6 MONTHS	30 DAY	ug/L
COPPER	EPA 200.7	6 MONTHS	30 DAY	ug/L
HARDNESS, TOTAL	CALCULATION	6 MONTHS	30 DAY	mg/L
IRON, DIS	EPA 200.7	6 MONTHS	30 DAY	ug/L
LEAD	EPA 200.8	6 MONTHS	30 DAY	ug/L
MAGNESIUM	EPA 200.7	6 MONTHS	30 DAY	mg/L
MANGANESE	EPA 200.8	6 MONTHS	30 DAY	ug/L
MOLYBDENUM	EPA 200.8	6 MONTHS	30 DAY	ug/L
NICKEL	EPA 200.7	6 MONTHS	30 DAY	ug/L
POTASSIUM	EPA 200.7	6 MONTHS	30 DAY	mg/L
SELENIUM	EPA 200.8	6 MONTHS	30 DAY	ug/L
SILVER	EPA 200.8	6 MONTHS	30 DAY	ug/L
SODIUM	EPA 200.7	6 MONTHS	30 DAY	mg/L
URANIUM	EPA 200.8	6 MONTHS	30 DAY	ug/L
ZINC	EPA 200.7	6 MONTHS	30 DAY	ug/L
ADDITIONAL METALS:				
MOLYBDENUM, TOTAL RECOVERABLE	EPA 200.8	6 MONTHS	30 DAY	ug/L
ARSENIC, TOTAL RECOVERABLE	EPA 200.8	6 MONTHS	30 DAY	ug/L
IRON, TOTAL RECOVERABLE	EPA 200.7	6 MONTHS	30 DAY	ug/L
CALCIUM, TOTAL	EPA 200.7	6 MONTHS	30 DAY	mg/L
MAGNESIUM, TOTAL	EPA 200.7	6 MONTHS	30 DAY	mg/L
POTASSIUM, TOTAL	EPA 200.7	6 MONTHS	30 DAY	mg/L
SODIUM, TOTAL	EPA 200.7	6 MONTHS	30 DAY	mg/L
NUTRIENTS:				
N-AMMONIA	EPA 350.1	28 DAYS	30 DAY	mg/L
N-NITRATE/NITRITE	EPA 353.2	28 DAYS	30 DAY	mg/L
PHOSPHORUS, TOTAL	EPA 365.1	28 DAYS	30 DAY	mg /L
TOTAL NITROGEN	TBD	28 DAYS	30 DAY	mg/L
FISH TISSUE:				
MERCURY IN FISH (includes prep cost)	EPA 7473	IF FROZEN, UNLIMITED	30 DAY	mg/kg
SELENIUM IN FISH	EPA 200.11	IF FROZEN, UNLIMITED	30 DAY	mg/kg
OTHER:				
ALKALINITY, TOTAL	EPA 310.1	14 DAYS	30 DAY	mg/L
BOD	SM 5210 B	48 HOURS	30 DAY	mg/L
BROMIDE	EPA 300.1	28 DAYS	30 DAY	mg/L
CHLORIDE	EPA 300.0	28 DAYS	30 DAY	mg/L
COD	EPA 410.1	28 DAYS	30 DAY	mg/L
DOC	EPA 415.1	28 DAYS	30 DAY	mg/L
SOLIDS, DISSOLVED	EPA 160.1	7 DAYS	30 DAY	mg/L
SOLIDS, SUSPENDED	EPA 160.2	7 DAYS	30 DAY	mg/L
SULFATE	EPA 300.0	28 DAYS	30 DAY	mg/L
SUVA – SPECIFIC UV ANALYSIS	SM 5910	498 HRS	30 DAY	abs/cm
TOC	EPA 415.1	28 DAYS	30 DAY	mg/L
URANIUM, TOTAL RECOVERABLE	EPA 200.8	6 MONTHS	30 DAY	ug/L

Metals are dissolved unless otherwise noted

APPENDIX D – SCHEDULE (MONITORING PLAN)

Station ID	Waterbody and Description	Visits	Lat	Long
66	Animas River at Bondad	1	37.03806	-107.874
9420	Animas River at Durango, at 9th St. Bridge	2	37.2598	-107.878
9421	Animas River at Lightner Creek	1	37.26815	-107.886
9488	Animas River above Cement Creek	1	37.81116	-107.659
9487	Animas River above Mineral Creek	1	37.80403	-107.664
82	Animas River at Silverton (trend site)	1	37.7902	-107.668
AN72	Animas River at gage just above railroad tracks	1	37.79028	-107.667
81	Animas River at Bakers Bridge	1	37.45667	-107.798
	Cement Creek above the mine	2	Coordinates not available at the time of this SAP development.	
	Effluent from Gold King mine	2		
	Cement Creek below the mine	2		
	Cement Creek above the Animas River confluence	2		
	Animas River above the Cement Creek confluence	2		
	Animas River below the Bear Creek confluence3	2		

Point of entry locations at public water systems will be sampled, as necessary, during the term of monitoring expected to occur. Locations will be sampled by Division staff. However, those locations are expected to be determined jointly by management and field staffs as current conditions are analyzed.

APPENDIX E – MAP OF SCHEDULED SITES ON ANIMAS RIVER

Quality Management Plan for the Collection and Utilization of Environmental Data. Colorado Department of Public Health and Environment, Water Quality Control Division. March 2011.

Standard Operating Procedures for the Collection of Water Samples Colorado Department of Public Health and Environment, Water Quality Control Division. March 2010.

Standard Operating Procedures for Water Quality Monitoring Activities. Colorado Department of Public Health and Environment, Water Quality Control Division. March 2010.

The Basic Standards and Methodologies for Surface Waters, Regulation No. 31 (5CCR1002-31). Colorado Department of Public Health and Environment, Water Quality Control Commission. December 2010.

16.0 APPROVAL

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Field Services Section Manager

8-17-15
Date

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